Wahl

C150

Advanced documenting multifunction calibrator thermometer

CE

C150, most advanced documenting multifunction instrument of the range, works not only as a simulator (IN / OUT) but also as a **dual channel thermometer (IN / IN)**. It calibrates **HART transmitters** (HART communicator integrated) and **thermistors**.

Description

C150 field documenting multifunction calibrator is the top instrument of the range. It is the perfect tool for advanced process maintenance and use on test bench in all industries. Suitable for all field and lab measurements, it can simultaneously measure and generate over two isolated channels various signals of temperature, resistance, process, pressure and frequency in one single instrument. C150 does not only work as a simulator (IN / OUT) but also as a **dual channel thermometer (IN / IN)** to perform comparison calibration. It calibrates **HART transmitters** (HART communicator integrated into ACL500 modem) and **thermistors**. Providing **extended functionalities** (temperature simulation, scaling, steps, synthesizer, statistical functions...) and audit trails, C150 complies with both 21 CFR Part 11 and NADCAP Heat Treatment standards and makes advanced data exploitation and full data traceability easier. High performances for C150, for advanced use:

- Temperature Up to 0.005 % RDG
- Resistance Up to 0.006 % RDG and 50 KΩ range
- Current: Up to 0.007 % RDG and 100 mA range + Loop Supply 24 V
- Voltage: Up to 0.005 % RDG and 50 V range
- Frequency: Up to 0.01 % RDG and 100 KHz range
- Pressure: With an external pressure module (comparison calibration with a pressure pump)

Using this user-friendly instrument, calibration tasks can be quickly carried out over the whole process chain. Take the lightweight recording process calibrator to the field with you during the whole week with **10 calibration procedures stored** in the device. Run the procedure after connecting the probes to the instrument (Easy connect system®) and save the results for onsite easy and quick calibration. Back to the office, you can then upload the data on a computer in order to **issue customized calibration certificates** with dedicated calibration software DATACAL. IP 54, fully protected by an anti-shock rubber holster, C150 integrates "easyconnect" terminals and a wide backlite display that makes it easy to use in any severe or dark conditions. When used with an external pressure module (ref. ACL433), C150 can measure and simulate pressure (comparison calibration with a pressure pump). C150 has also the capability to drive baths and dry-blocks when associated with the specific cable (ref. ACL600).

Easy connection system®

Connect your probes by simply pushing on the terminal top and insert wires of up to 3 mm or 10 AWG diameter and compensated thermocouple connectors. Wires are held tight between two brass plates ensuring thermal stability and a very good cold junction compensation for thermocouples. This system also enables 4 mm banana plugs and security connectors to be connected on the terminal top.

C Series, 4 models from basic use to advanced performances

Specifications		C50	C75	C100	C150
Top accuracy		200 ppm		130 ppm	50 ppm
Temperature accuracy	Thermocouples (14) RTDs (12)	0.013% RDG for Tc K 0.012% RDG		0.01% RDG for Tc K 0.01% RDG	0.005% RDG for Tc K 0.006% RDG
DC current + Loop supply 24 V	Range Accuracy	50 mA 0.0175% RDG			100 mA 0.007% RDG
DC voltage	Range Accuracy	50 V IN / 20 V OUT 0.013% RDG	50 V 0.013% RDG	50 V 0.010% RDG	50 V 0.005% RDG
Frequency	Range Accuracy	20 KHz IN / 10 KHz OUT 0.005% RDG			100 KHz 0.01% RDG
Resistance	Range Accuracy	4000 Ω 0.012% RDG		4000 Ω 0.010% RDG	50 KΩ 0.006% RDG
Pressure	Range Accuracy		Relative pressure: 30 bar / Absolute pressure: 1,000 bar 0.05% RDG		
Compliance to standards					21 CFR Part 11
					NADCAP Heat

				treatment AMS 2750
Additional functions	Advanced data exploitation: Scaling, relative measurement, simulation of ramps and steps, synthetizer, square root, statistical functions Transmitter function			
Additional functions		Switch test Calibration of transmitters		
Additional functions				Comparison calibration HART: Digital calibration and data transfer Calibration of thermistors
Software		DATACAL calibration software for configuration and data management		
Memory		10,000 data stored and recalled on screen as curve or list		

Specifications

Specifications and performances in temperature @23°C ±5°C

Uncertainty is given in % of reading (C150 display) + fixed value.

Resistive probes: Measurement and simulation

Sensor	Range (Input and Output)	Resolution	Accuracy / 1 year (Measurement)	Accuracy / 1 year (Simulation)
Pt50 (α = 3851)	-220°C to +850°C	0.01°C	0.006% RDG + 0.04°C	0.006% RDG + 0.04°C
Pt100 (α = 3851)	-220°C to +850°C	0.01°C	0.006% RDG + 0.03°C	0.006% RDG + 0.03°C
Pt100 (α = 3916)	-200°C to +510°C	0.01°C	0.006% RDG + 0.03°C	0.006% RDG + 0.03°C
Pt100 (α = 3926)	-210°C to +850°C	0.01°C	0.006% RDG + 0.03°C	0.006% RDG + 0.03°C
Pt200 (α = 3851)	-220°C to +850°C	0.01°C	0.006% RDG + 0.04°C	0.006% RDG + 0.04°C
Pt500 (α = 3851)	-220°C to +850°C	0.01°C	0.006% RDG + 0.03°C	0.006% RDG + 0.03°C
Pt1000 (α = 3851)	-220°C to +740°C	0.01°C	0.006% RDG + 0.03°C	0.006% RDG + 0.03°C
Ni100 (α = 618)	-60°C to 180°C	0.01°C	0.006% RDG + 0.05°C	0.006% RDG + 0.05°C
Ni120 (α = 672)	-40°C to +205°C	0.01°C	0.006% RDG + 0.05°C	0.006% RDG + 0.05°C
Ni1000 (α = 618)	-60°C to +180°C	0.01°C	0.006% RDG + 0.05°C	0.006% RDG + 0.05°C
Cu10 (α = 427)	-50°C to 150°C	0.10°C	0.006% RDG + 0.18°C	0.006% RDG + 0.18°C
Cu50 (α = 428)	-50°C to +200°C	0.01°C	0.006% RDG + 0.05°C	0.006% RDG + 0.05°C

Resistive probes measurements in 2, 3 or 4 wires: automatic recognition of number of connected wires, with indication on screen Accuracies are given for 4-wire mounted probes Take into account particular error of temperature sensor used and implementation conditions Admissible measuring current: 0.01 mA to 4 mA In simulation mode, specifications given for 1 mA measuring current (Pt50 / 100, Ni100 / 120, Cu10 / 50) or 0.1 mA (Pt200 / 500 / 1000, Ni1000) Temperature coefficient: < 10% of accuracy /°C

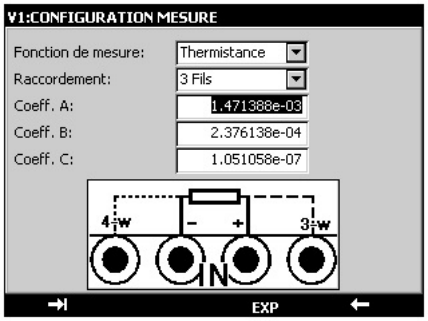
Thermocouples: Measurement and simulation

Type	Input range	Resolution	Accuracy / 1 year (Measurement)	Output range	Resolution	Accuracy / 1 year (Simulation)
K	-250 to -200°C -200 to -120°C -120 to +1372°C	0.10°C 0.05°C 0.01°C	0.50°C 0.15°C 0.005% RDG + 0.08°C	-250 to -50°C -50 to +120°C +120 to +1020°C +1020 to +1370°C	0.01°C 0.01°C 0.01°C 0.01°C	0.15% RDG 0.06°C 0.005% RDG + 0.05°C 0.007% RDG + 0.05°C
T	-250 to -200°C -200 to -100°C -100 to +80°C +80 to +400°C	0.1°C 0.01°C 0.01°C 0.01°C	0.50°C 0.05% RDG + 0.06°C 0.015% RDG + 0.07°C 0.06°C	-250 to -100°C -100 to +0°C +0 to +400°C	0.01°C 0.01°C 0.01°C	0.1% RDG + 0.05°C 0.02% RDG + 0.06°C 0.055°C
J	-210 to -120°C -120 to +60°C +60 to +1200°C	0.01°C 0.01°C 0.01°C	0.15°C 0.005% RDG + 0.07°C 0.0025% RDG + 0.06°C	-210 to +0°C +0 to +50°C +50 to +1200°C	0.01°C 0.01°C 0.01°C	0.03% RDG + 0.08°C 0.05% RDG + 0.07°C 0.005% RDG + 0.04°C
R	-50 to +150°C +150 to +550°C +550 to 1768°C	0.20°C 0.10°C 0.01°C	+0.60°C +0.30°C +0.30°C	-50 to +0°C +0 to +350°C +350 to +1768°C	0.01°C 0.01°C 0.01°C	0.35% RDG + 0.4°C +0.4°C +0.25°C
S	-50 to +150°C +150 to +550°C +550 to +1450°C +1450 to +1768°C	0.20°C 0.10°C 0.05°C 0.05°C	0.80°C 0.30°C 0.30°C 0.35°C	-50 to +0°C +0 to +350°C +350 to +1768°C	0.01°C 0.01°C 0.01°C	0.25% RDG + 0.4°C 0.30°C 0.25°C
B	+400 to +900°C +900 to +1820°C	0.10°C 0.05°C	0.005% RDG + 0.4°C 0.005% RDG + 0.2°C	+400 to +900°C +900 to +1820°C	0.01°C 0.01°C	0.005% RDG + 0.4°C 0.005% RDG + 0.2°C
U	-200 to -100°C -100 to +660°C	0.01°C 0.01°C	+0.13°C +0.09°C	-200 to +400°C +400 to +600°C	0.05°C 0.05°C	+0.09°C +0.11°C
N	-240 to -190°C -190 to -110°C -110 to +0°C +0 to +400°C	0.10°C 0.05°C 0.01°C 0.01°C 0.01°C	0.25% RDG 0.10% RDG 0.04% RDG + 0.06°C 0.08°C 0.005% RDG	-240 to -200°C -200 to +10°C +10 to +250°C +250 to	0.01°C 0.01°C 0.01°C 0.01°C	0.15% RDG +0.10°C +0.08°C 0.008% RDG + 0.05°C

	+400 to +1300°C		+ 0.06°C	+1300°C		

Thermocouples: PlatineL, Mo, NiMo/NiCo, G, D, L, C: For specifications, refer to the instruction manual (Available on request) Accuracy is given for reference @ 0°C. When using the internal reference junction (except couple B) add an additional uncertainty of 0.2 °C at 0 °C. It is possible (thermocouple B excepted) to choose by programming the cold junction localization: External at 0°C, internal (temperature compensation of instrument's terminals) or manually entered. Temperature coefficient: <10% of accuracy /°C Display unit: °C and F.

Thermistors: Measurement (Channel 1)



With 50 K ohms range and Steinhart – Hart equation integrated, thermistors can be entered into C150 and tested. Steinhart-Hart equation is as follows: $\frac{1}{T} = A + B(\ln(R)) + C(\ln(R))3$ Where: A, B and C are usually calculated according to temperature at 0°C, 25°C and 70°C

Specifications and performances in pressure @23°C ±5°C

Pressure: Measurement by external digital sensor

Range	0-1 bar	0-3 bar	0-10 bar	0-30 bar	0-100 bar	0-300 bar	0-1000 bar
Absolute	X	X	X	X	X	X	X
Relative	X	X	X	X			

Available in relative, absolute and differential pressure. Connector: ¼ gas Resolution: 0.02% FS Accuracy: -0.05% FS from 10 to 40°C - 0.1% FS from -10 to +10°C and from 40 to 80°C This digital pressure module ACL433 is connected to C150 through RS485 serial cable to the digital input connector. All data are digital. Measurements are compensated in temperature by a polynomial correction implemented into the firmware at factory.

Specifications and performances in process @23°C ±5°C

DC current: Measurement

With or without loop supply

Range	Measurement range	Res.	Accuracy / 1 year	Rin
0-20 mA	0 mA to 24 mA	0.1 µA	0.007% RDG + 0.8 µA	< 30 Ω
4-20 mA	3 mA to 24 mA	0.1 µA	0.007% RDG + 0.8 µA	< 30 Ω
100 mA	0 mA to 100 mA	0.1 µA	0.009% RDG + 2 µA	< 30 Ω

Temperature coefficient: < 7 ppm/°C from 0°C to 18°C and 28°C to 50 °C Loop supply: 24 V ± 10% HART® compatibility: Input impedance Rin = 280 Ω Display with linear or quadratic scaling

DC voltage: Measurement

Range	Measurement range	Res.	Accuracy / 1 year	Rin
+100 mV	-10 mV to +100 mV	1 V	0.005% RDG + 2 µV	> 10 MΩ
+1 V	-100mV to +1 V	10 V	0.005% RDG + 8 µV	> 10 MΩ
+10 V	-1 V to +10 V	100 V	0;007% RDG + 80 µV	= 1 MΩ
+50 V	-5 V to +50 V	1 mV	0;007% RDG + 0.5 mV	= 1 MΩ

Frequency, counting: Measurement

Range	Resolution	Accuracy / 1 year
10 kHz	< 0.01 Hz	0.01% RDG
100 kHz	0.1 Hz	0.01% RDG

Scale unit: Pulse / min and Hz Trigger level: 1 V Measurement on frequency signals or dry contacts. Counting will be performed on defined time or infinite time.

Resistance: Measurement

Range	Measurement range	Resolution	Accuracy / 1 year
400 Ω	0 to 400 Ω	1 mΩ	0.006% RDG + 8 mΩ
3600 Ω	0 to 3600 Ω	10 mΩ	0.006% RDG + 50 mΩ
50 kΩ	0 to 50 kΩ	100 mΩ	0.008% RDG + 1 Ω

Resistance measurement in 2, 3 or 4 wires: automatic recognition of number of connected wires, with indication on screen Accuracies are given for 4-wire mounted probes

DC current: Emission

With or without loop supply

Range	Resolution	Accuracy / 1 year
24 mA	0.1 µA	0.007% RDG + 0.8 µA
4-20 mA	0.1 µA	0.007% RDG + 0.8 µA
0-20 mA	0.1 µA	0.007% RDG + 0.8 µA

Temperature Coefficient < 7 ppm/°C from 0°C to 18°C and 28°C to 50 °C Specifications given for C150 configurations in:
- Active mode (+24V ON) 1 Meter in passive mode (+24 V OFF)
- Passive mode (+24 V OFF) 1 Meter in active mode (+24 V ON)

Pre-programmed steps

	0%	25%	50%	75%	100%
4-20 mA linear	4	8	12	16	20
0-20 mA linear	0	5	10	15	20
4-20 mA quad	4	5	8	13	20
0-20 mA quad	0	1.25	5	11,25	20
4-20 mA valves	3.8-4-4.2		12		19, 20, 21

DC voltage: Emission

Range	Emission range	Res.	Accuracy / 1 year	Min load
+100m V	-5m V to +100 mV	1 V	0.005% RDG + 2 V	1 kΩ
+1 V	-5mV to +1 V	10 V	0.005% RDG + 8 V	2 kΩ
+10 V	-100mV to +10 V	100 V	0.007% RDG + 80 V	4 kΩ
+50 V	-100 mV to + 50 V	1 mV	0.007% RDG + 0.5 mV	4 kΩ

Frequency, pulse: Emission

Range	Resolution	Accuracy / 1 year
1000 Hz	0.01 Hz	0.01% RDG
100 kHz	1 Hz	0.01% RDG

Scale unit: Pulse / min and Hz Pulse emission and dry contacts simulation. Max. amplitude: 20 V (User selectable)

Resistance: Emission

Range	Emission range	Res.	Accuracy / 1 year	Nota: Iext
400 Ω	1 to 400 Ω	10 mΩ	0.006% RDG + 20 mΩ	0.1 mA / 4 mA

3600 Ω	10 to 3600 Ω	100 mΩ	0.006% RDG + 100 mΩ	0.1 mA / 4 mA

Emission with pulsed current available: refer to the instruction manual for specifications Temperature coefficient: < 5 ppm/°C from 0°C to 18°C and 28°C to 50 °C. Current establishing time: <1ms Compatibility with smart transmitters Iext : Current received by the calibrator

Further features

Scaling in measurement and simulation modes	Scaling allows process signals to be displayed in % of FS or in all other units. This function also allows sensors to be corrected after a calibration.
Relative measurement	

Models and accessories

Instrument:

C150 On-site documenting multifunction calibrator

Delivered standard with:

- Quick start manual
- Battery charger
- Set of 6 testing leads
- Carrying strap
- Factory test report

Accessories:

Call Customer Service for a complete list of Accessories

Software:

DATACAL Calibration software for C75 / 100 / 150 Supplied with USB cable

Certification:

Certificate of Conformance With all relevant data points where the device has been tested

Packing information:

Size 210 mm x 110 mm x 50 mm
Weight 900 g